Trends and levels of persistent organic contaminants in the Arctic atmosphere

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Introduction

Atmospheric long-range transport has shown to be a major transport route for anthropogenic pollutants into the remote Arctic regions. In particular, selected persistent organic pollutants (POPs) are prone to atmospheric long-range transport due to their characteristic physico-chemical properties. Therefore, in the frame of AMAP, all circum-arctic nations maintain atmospheric monitoring initiatives for anthropogenic contaminants in order to assess the environmental risk posed by this type of contaminants. For the first time a comprehensive trend study is now attempted based on long-term measurements from 6 stations in 5 Arctic countries.

General Background

In the here presented study, results from long-term measurement campaigns (1992 – 2000) on persistent organic pollutants (POPs) were reported from six research stations to the AMAP Data Centre on a regular basis. A general comparison of POP levels and trends in the Arctic atmosphere based on data from the research stations Tagish (Canada), Alert (Canada), Pallas (Finland), Storhofdi (Iceland), Dunai (Russia) and Zeppelin (Svalbard, Norway) is presented (table 1)

Table 1: POP measurements in ambient air from 6 sample Arctic monitoring

	Tagish	**Alert**	**Pallas**	**Storhofdi**	**Dunai**	**Zeppelin**
Country	Canada	Canada	Finland	Iceland	Russia	Svalbard (Norway)
Sampling period	1993-1995	1992-1998	1996-1999	1995-1999	1993	1993-2000
Compounds analysed	Chlorinated pesticides, PCB and PAH	Chlorinated pesticides, PCB and PAH	Chlorinated pesticides, PCB and PAH	Chlorinated pesticides, PCB	Chlorinated pesticides, PCB and PAH	Chlorinated pesticides, PCB and PAH
Sampling frequency	Weekly	Weekly	One week/ month	Every second week	Weekly	Weekly

Similar sampling techniques were used at all sampling sites. Selected numbers of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl congeners (PCBs) and chlorinated pesticides were analyzed in all samples.

Results

For PAHs no significant trends were found for the atmospheric samples from all six stations. However, whereas a continuous increase of the annual average PAH concentrations (from 20 up to 220 pg/m^3) was observed for Tagish (1992-1994) with a clear decrease from 1994 to 1995, the Alert data set showed a continuous concentration reduction from 1992 to 1995. No comparable tendencies for PAHs were observed in air from the Zeppelin station (1993 – 2000).
For PCBs, for all sampling sites included in the present comparison, no significant downward trends were derived from the reported data. (figure 1).

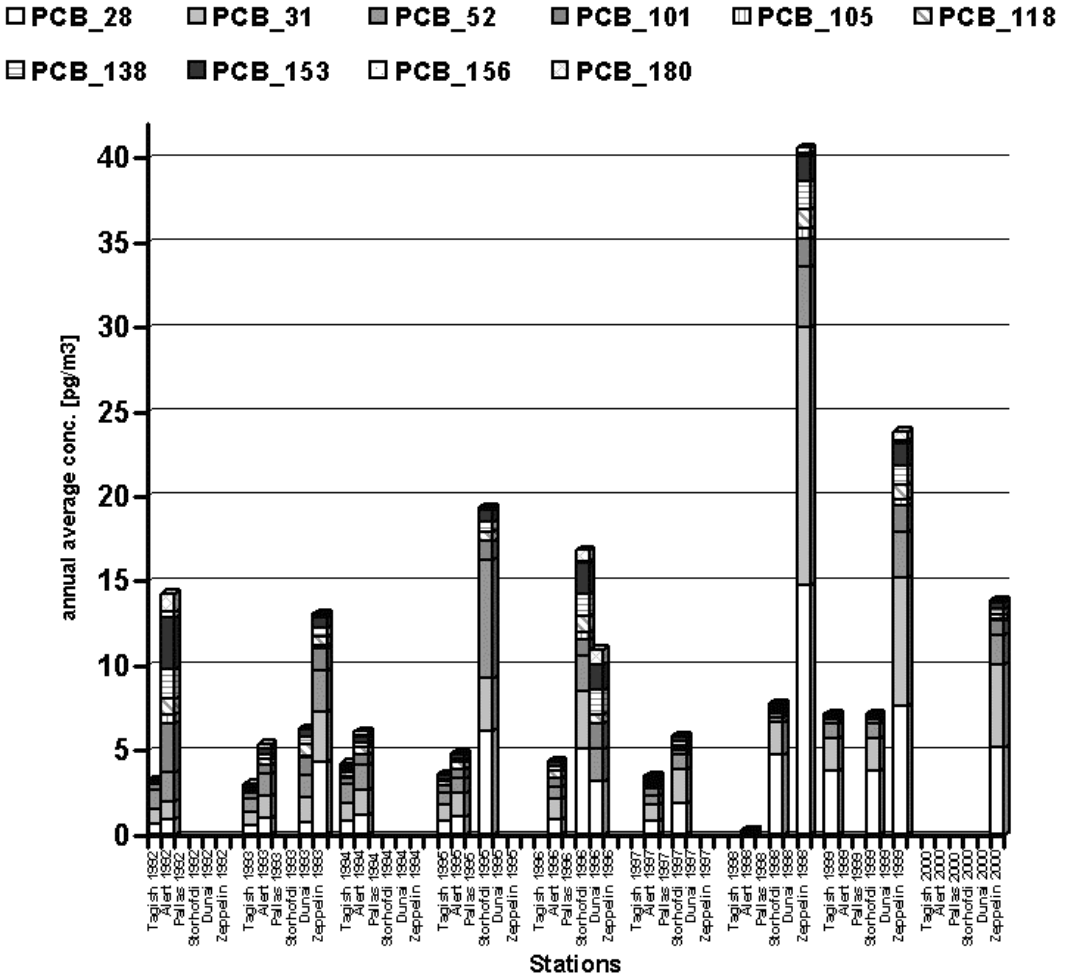

Figure 1: Annual average Sum PCB concentrations (10 congeners) in atmospheric samples from 6 Arctic monitoring stations

For Hexachlorocyclohexane isomers (HCHs), a general increase with a maximum average concentration in 1993 and a subsequent continuous decrease from 1993 to 2000 was found for all stations (figure 2). In all Arctic atmospheric samples γ-HCH represents about 15-30% of the total α- and γ-HCH burden. This distribution seems to be independent from the geographic location of the station. The lowest Sum HCH (α–

+ γ-HCH) average concentrations were measured in the Storhofdi samples (Iceland). The highest Sum HCH concentrations were found for the Zeppelin station samples in 1993 (Svalbard, Norway).

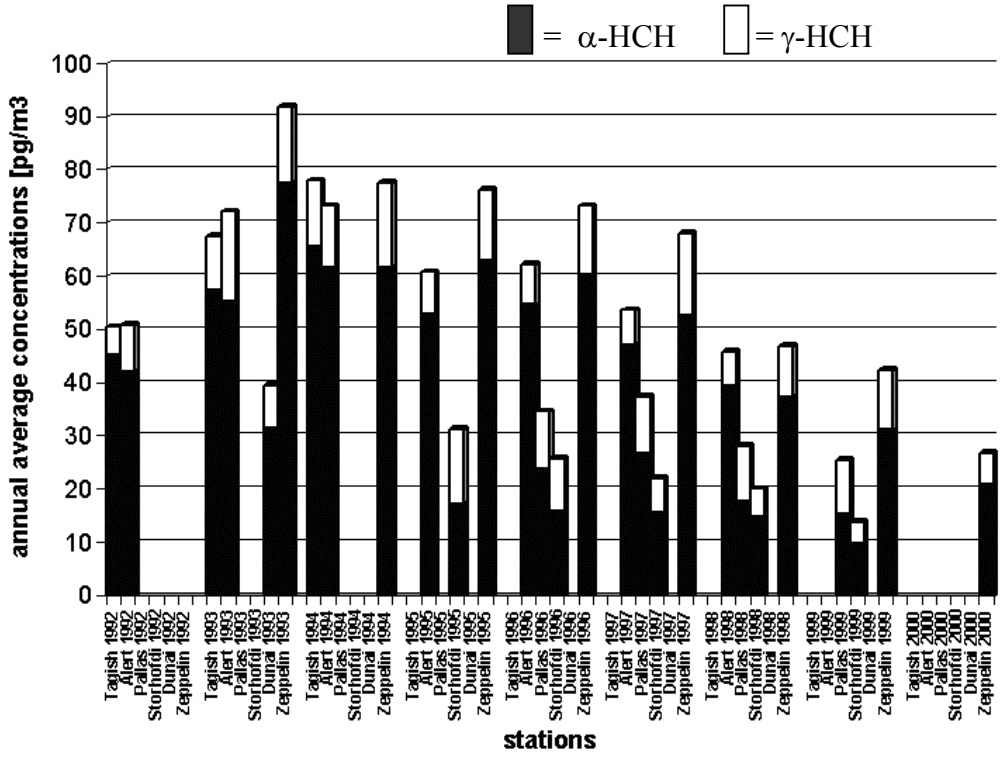

Figure 2: Annual average concentrations of α- and γ-HCHs in atmospheric samples from 6 Arctic monitoring stations

In addition to the above-discussed compound groups, spatial and temporal trends for chlorinated cyclodiene pesticides as well as dichlorodiphenyltrichloroethane (DDT) derivatives will be discussed in the presentation. In addition, scientific aspects on quality assurance and control aspects as well as data and sampling harmonization will we included.